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The effects of a shear flow on lee waves MICHAEL PATTERSON, University of Bath, STUART DALZIEL, DAMTP, University of Cambridge, COLM CAULFIELD, BP Institute & DAMTP, University of Cambridge, STÉPHANE LE BRUN, DAMTP, University of Cambridge & École Polytechnique, France — We explore experimentally and theoretically the effects of a shear flow on lee waves that are generated by a stationary isolated three-dimensional obstacle in a low-Froude-number stratified flow. We observe that the uniform flow (beneath the shear layer) can be divided into two regions: an essentially two-dimensional flow around the base of the obstacle and a wave-generating flow over the top portion of the obstacle. The third region's structure is dependent on the sign of the shear, and is either a wave-free region above the critical height where the wave speed equals the local fluid speed or a region in which the waves are fully reflected. By separating the permanent waves produced into distinct categories, we compare detailed experimental measurements with theoretical predictions. Finally we examine the time-dependent establishment of the waves, including the transition from a uniform flow to a sheared flow.

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